University of Saskatchewan

Department of Computer Science

CMPT 250.6 Midterm Exam #2

March 9, 2001

CLOSED BOOK TIME: 55 minutes

Marks

12 1.Two lexically-ordered binary trees containing integer data are said to be identical if both trees have the same structure and corresponding nodes have the same data. Formulate a recursive function that returns true if the two trees are identical; otherwise, false. Assume that the trees are instances of the class LINKED_SIMPLE_TREE_UOS[INTEGER]. Your recursive function should have the following signature:

identical (t2:LINKED_SIMPLE_TREE_UOS[INTEGER]) : BOOLEAN

This function is called as follows:

t1 . identical (t2)

Some of the features of LINKED_SIMPLE_TREE_UOS[G] are:

is_empty : BOOLEAN

root_left_subtree : LINKED_SIMPLE_TREE_UOS [G]

root_right_subtree : LINKED_SIMPLE_TREE_UOS [G]

root_item : G

5 2. List five (5) testing guidelines that are important in fostering a proper attitude to testing a program.

10 3. a) What are some important properties of a collision resolution technique?

b) In each of the following situations, where M denotes the table size, decide whether open addressing or chaining would be preferable and why:

i) Space is important, the item size is small, and the actual number of items to be stored will be only slightly less than M.

ii) Time is important, and the actual number of items to be stored will be only slightly less than M.

c) i) Explain briefly double bashing.

ii) Why is it used?

15 4. a) Show a trace of the construction of a height-balanced tree assuming a set of records with the following key values are used in creating the tree:

{APPLE, IBM, SUN, DEC, HP, UNISYS, CDC}

The order of insertion is given by the order of the previous set (i.e., APPLE first, IBM second, …, CDC last). *Note*, you may use the first letter of a name as an abbreviation in developing your trace.

b) Construct a weight-balanced tree that would be formed given that the same set of ordered insertions as in part (a) are performed followed by two requests for information: one on IBM and one on DEC.

c) What would be the expected average length of search (ALOS) for the tree you have constructed in part (a) given that in the future it is expected that the frequency of requests for information on these computer companies are equal, with the exception of IBM, for which information will be requested four

times more often than for any one of the other companies.

8 6. Prove that if n is even, then $13^n + 6$ is divisible by 7. Make sure you indicate where the inductive hypothesis is used in your proof.

Total Marks - 50